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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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09/23/2005

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EXAMINER

PATEL, REEMA

ART UNIT

PAPER NUMBER

2812

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DELIVERY MODE

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PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/549,851	Applicant(s) HASEBE ET AL.	
	Examiner REEMA PATEL	Art Unit 2812	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 09 May 2008.
- 2a) ☐ This action is **FINAL**. 2b) ☒ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 2-16 and 19-22 is/are pending in the application.
- 4a) Of the above claim(s) 2,3,13 and 14 is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 4-12,15,16 and 19-22 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 23 September 2005 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☒ All b) ☐ Some * c) ☐ None of:
1. ☒ Certified copies of the priority documents have been received.
2. ☐ Certified copies of the priority documents have been received in Application No. _____.
3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413) |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | Paper No(s)/Mail Date. _____ |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Continued Examination Under 37 CFR 1.114

1. A request for continued examination under 37 CFR 1.114, including the fee set forth in 37 CFR 1.17(e), was filed in this application after final rejection. Since this application is eligible for continued examination under 37 CFR 1.114, and the fee set forth in 37 CFR 1.17(e) has been timely paid, the finality of the previous Office action has been withdrawn pursuant to 37 CFR 1.114. Applicant's submission filed on 5/9/08 has been entered.

2. Examiner acknowledges a typographical error in Claim 16 of the amended claims submitted with the request for consideration which indicates the status of claim 16 as 'Original' instead of 'Currently Amended'. This was articulated by the attorney-of-record, Mr. Thomas Jackson (Reg. 29,808), to the Examiner in a telephone conversation on May 14, 2008.

Claim Objections

3. Claims 12 and 15 are objected to because of the following informalities: These claims would be easier to read if more commas were added to separate various phrases. Examiner suggests the following changes:

- Claim 12, line 13, change " to said recipe" to - - to said recipe, - -
- Claim 12, line 15, change "range, purging" to - - range, purging, - -
- Claim 15, line 16: change " to said recipe" to - - to said recipe, - -
- Claim 15, line 18: change "range, purging" to - - range, purging, - -

Claim Rejections - 35 USC § 112

4. The following is a quotation of the second paragraph of 35 U.S.C. 112:

The specification shall conclude with one or more claims particularly pointing out and distinctly claiming the subject matter which the applicant regards as his invention.

5. Claims 4 and 11 are rejected under 35 U.S.C. 112, second paragraph, as being indefinite for failing to particularly point out and distinctly claim the subject matter which applicant regards as the invention.

6. Regarding claim 4, this claim states that loading and unloading of the object to be processed from the chamber occurs at "normal pressure" (lines 11, 15). However, this term is not quantified in the specification nor is it a term whose value is readily known to those skilled in the art. The term "normal pressure" could refer to atmospheric or vacuum pressure, or for that matter, any arbitrary pressure. For the purposes of examination, the Examiner has equated "normal pressure" with vacuum pressure. However, appropriate clarification is required.

7. Regarding claim 11, as written this independent claim depends on independent claim 4. This is incorrect form. Applicant may amend the claim to make claim 11 in proper dependent form by stating its dependence on claim 4 in the preamble and deleting "...in accordance with a cleaning method of a film-forming unit according to claim 4". Alternatively, applicant may insert the actual limitations of claim 4 into claim 11.

Claim Rejections - 35 USC § 102

8. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

9. Claims 12 and 15 are rejected under 35 U.S.C. 102(e) as being anticipated by Ishibashi (U.S. 6,942,892 B1).

10. Regarding claims 12 and 15, Ishibashi discloses a film forming unit comprising:

- a) A cleaning-gas supplying unit that supplies directly into the reaction chamber a cleaning gas that includes fluorine (col 5, lines 18-25; col 7, lines 16-19; col 8, lines 28-35);
- b) A material gas supplying unit that supplies directly into the reaction chamber a material gas that is capable of being activated (col 5, lines 18-25; col 6, lines 18-22);
- c) An activating unit (3, Fig. 1) that activates the material gas, the activating unit being a heating unit (col 6, lines 18-22);
- d) A nitriding unit (30, Fig. 1) that nitrides a surface of a member in the reaction chamber by controlling the activating unit so as to activate the material gas (col 5, lines 37-45).
- e) A controlling unit capable of controlling a flow of nitrogen-including gas ('flow controller'; col 5, lines 28-31), and the processing temperatures ('electric current'; col 5, lines 37-45) and pressures ('exhaust system 11'; col 5, lines 33-36) during various steps in the process.

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11. Regarding (a)-(b), Fig. 1 of Ishibashi illustrates combining the cleaning gas and material gas before entering the chamber. However, Ishibashi further discloses that the cleaning gas may be introduced through a different route than that of the material gas, for example through a nozzle (col 7, lines 16-19). Hence, in such a case, the cleaning gas supply and material gas supplying units can be thought to each individually supply their respective gases directly into the film forming unit.

Claim Rejections - 35 USC § 103

12. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

13. Claims 4-11 and 21-22 are rejected under 35 U.S.C. 103(a) as being unpatentable over Bolscher et al. (U.S. 6,468,903 B2; hereinafter 'Bolscher') in view of Goto et al. (U.S. 2003/0010354 A1; hereinafter 'Goto') and Yoo (U.S. 2002/0102859 A1).

14. Regarding claims 4 and 21, Bolscher discloses a method comprising:

- A deposit-removing step of removing a deposit stuck to an inside of a film-forming unit (col 2, line 58-62);
- A purging step of purging an inside of the reaction chamber by supplying into the reaction chamber a nitrogen-including gas that includes nitrogen and that is capable of being activated (col 2, line 63 - col 3, line 4),

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- Wherein the purging step has a step of nitriding a surface of a member in the reaction chamber by activating the nitrogen-including gas (col 2, line 63 - col 3, line 4).

15. Furthermore, Bolscher discloses the purging step is performed at a temperature (850°C) and a pressure (66 Pa) (col 3, lines 6-12).

16. Yet, Bolscher does not disclose the following:

- a) The deposit-removing step occurs by supplying aqueous HF at a predetermined pressure range.
- b) Loading and unloading the object at a pressure and temperature, wherein the temperature is less than that of during the purging step.

17. Regarding (a), Bolscher discloses that the deposit-removing step occurs by supplying aqueous HF (col 2, lines 58-62) and not a fluorine-containing gas. However, Goto discloses removing various residues from the walls of a film-forming unit by supplying molecular fluorine gas (F₂) ([0009], [0012]). Such a process has the advantage of removing residue without using a solvent and hence producing less waste. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Bolscher with using F₂ gas, as taught by Goto, so as to remove deposits from the film-forming unit while producing less waste.

18. Regarding (b), Bolscher discloses loading and unloading the object to be processed (col 4, lines 23-30) but does not disclose temperatures and pressures for these steps. However, Yoo discloses a processing sequence in which wafers are loaded and unloaded from a chamber at vacuum pressure ([0010]) and a temperature

less than 200°C ([0026]). Selecting such a pressure and temperature allows for easier wafer handling during the loading and unloading steps. Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Bolscher with loading and unloading the wafers at a normal pressure and temperature less than the purging temperature (850°C), as taught by Yoo, so as to ease wafer handling.

19. Regarding claims 5 and 7-9, Bolshcer discloses the nitrogen-including gas is ammonia (col 2, lines 33-34), the gas supplied to the reaction chamber is heated to a predetermined temperature (col 3, lines 4-12), the inside of the reaction chamber is heated to a range of 600-1050° C (col 3, lines 4-12), and the member in the reaction chamber consists of quartz (col 2, lines 29-31).

20. Regarding claim 6 Bolscher discloses the maintaining a pressure during the purging process (col 3, lines 6-12) but does not disclose that the pressure is between 133 Pa and 53.3 kPa. However, it would have been obvious to one having ordinary skill in the art at the time the invention was made to select a pressure in between the range of 133 Pa and 55.3 kPa, since it has been held that where the general conditions of a claim are disclosed in the prior art, discovering the optimum or workable ranges involves only routine skill in the art. *In re Aller*, 105 USPQ 233.

21. Regarding claim 10, Bolscher, Goto, and Yoo disclose the nitrogen-including gas is an ammonia gas (Bolscher: col 2, lines 33-34) and also discloses that the film-forming apparatus can form a silicon nitride film (Bolscher col 3, lines 37-39). Yet, they are silent

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with regards to the process gas that can be used to form such a film. However, the examiner takes Official Notice that the use of ammonia and a Si-containing gas as process gases in forming a silicon nitride film is well known in the art (see for example, Agusta et al. (U.S. 3,865,652), col 3, lines 45-53). Therefore, it would have been obvious to one having ordinary skill in the art at the time the invention was made to modify the invention of Bolscher, Goto, and Yoo with forming the silicon nitride film using a process gas comprising ammonia and a silicon-including gas so as to use readily available silicon nitride-forming precursors.

22. Regarding claim 11, Bolscher discloses a film-forming step of heating the inside of the reaction chamber containing the object to be processed to a predetermined temperature (col 2, line 67 - col 3, line 12), and forming a thin film on the object to be processed by supplying a process gas into the reaction chamber (col 3, lines 37-39).

23. Regarding claim 22, Bolscher discloses the thin film is a silicon nitride film (col 3, lines 36-39).

24. Claims 16 and 19-20 are rejected under 35 U.S.C. 103(a) as being unpatentable over Ishibashi (U.S. 6,942,892 B1; hereinafter '892') as applied to claims 12 and 15 above.

25. Regarding claim 16, Ishibashi indicates that the apparatus comprises a gas inlet to allow gases to enter the chamber. The limitation that "the nitrogen-including gas is ammonia, dinitrogen monoxide or nitric oxide" is not given patentable weight because a claim containing a "recitation with respect to the manner in which a claimed apparatus is

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intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (MPEP 2114).

26. Regarding claim 19, Ishibashi discloses the heating unit is capable of heating the inside of the reaction chamber (col 5, lines 37-45; col 6, lines 4-12). The phrase, “wherein the heating unit heats...to a range of 600°C to 1050°C” is not patentable weight because a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (MPEP 2114).

27. Regarding claim 20, Ishibashi discloses a pressure adjusting unit (col 5, lines 33-36). The phrase, “a pressure-adjusting unit...that maintains [the pressure]...at a range of 133 Pa to 53.3 kPa” is not patentable weight because a claim containing a “recitation with respect to the manner in which a claimed apparatus is intended to be employed does not differentiate the claimed apparatus from a prior art apparatus” if the prior art apparatus teaches all the structural limitations of the claim. *Ex parte Masham*, 2 USPQ2d 1647 (Bd. Pat. App. & Inter. 1987) (MPEP 2114).

Response to Arguments

28. Applicant's arguments with respect to claims 4-12, 15-16, and 19-22 have been considered but are moot in view of the new ground(s) of rejection.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to REEMA PATEL whose telephone number is (571)270-1436. The examiner can normally be reached on M-F, 8:00-4:30 ET.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Charles Garber can be reached on (571)272-2194. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

/Reema Patel/
Examiner, Art Unit 2812
7/30/08

/Charles D. Garber/
Supervisory Patent Examiner, Art Unit 2812